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THE Sidereal Messenger.

Conducted by Wm. W. PAYNE,
Director of Carleton College Observatory.

NOVEMBER, 1882.

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"The voice that rolls the stars along,
Speaks all the promises."

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The Sidereal Messenger.

"In the present small treatise I set forth some matters of interest to all observers of natural phenomena to look at and consider."—GALILEO. *Sidereus Nuncius*, 1610.

VOL. 1. NOVEMBER, 1882. No 7.

COMET CRULS.

PROFESSOR C. S. HASTINGS, JOHNS HOPKINS UNIVERSITY.

Early risers saw on the morning of Sept. 30, the most magnificent celestial spectacle which has been presented to us for a quarter of a century; for not since the great comet of Donati, in 1858, has so splendid an object appeared. Rising nearly due east at about 4:30 this morning, the most favorable time for observation was during the quarter of an hour preceding 5 o'clock, as at that time its apparant brilliancy commenced to grow less from approaching dawn, so that a quarter of an hour later the tail was nearly lost to sight. The head was marked by a very brilliant nucleus, considerably elongated and with its major axis inclined 10° or 15° to the general direction of the tail. The tail, stretching to the south-west for a distance of 15°, according to comparison with known intervals between stars, was marked by a very intense and well-defined lower edge curving upwards from the horizon and terminating with more sharpness than would have been anticipated; the upper border was far less distinct. Notable features were two rifts—one, very pronounced, extended from the nucleus to the extreme end, while the other, which required much closer inspection, was about half the length of the comet, remote from the head, and nearly parallel to the first. It

was noted that these rifts were not divergent, as though having a common origin in the nucleus, but that the fainter one carried with it a suggestion of having previously been in line with the nucleus, but left behind by the more solid part of the comet in its motion. Indeed, from what we know of the manner in which the tail of a comet is produced, this suggestion is very likely the true explanation of its formation, for observation has shown that the tail is produced by matter which, apparently under the influence of heat, rises from that side of the nucleus which is turned towards the sun, and is then strongly repelled. From this it is easy to see why the tail is directed from the sun; why the tail may be more or less curved, since there is no reason why the tenuous matter driven from the head should keep up with it in its orbital motion, and why, finally, there should be a fainter central line or rift behind the nucleus, since the material for the tail is evolved on the sun-ward side of the head only, and must pass around it before it can be driven off into space. In many large comets it has been observed that this material for the tail rises in envelopes from the nucleus, not constantly, but periodically; and as this is in all probability a universal characteristic, we must regard the tail as renewed periodically. Hence we are led to believe that the fainter rift observed was really the remnants of a tail which was produced at an earlier time, though perhaps earlier only by a few hours. Doubtless the oval form of the nucleus was due to an envelope, which, first thrown upwards towards the sun, had already begun to yield to the repulsive force, and may go to swell the splendor of the comet for to-morrow. This explanation of the formation of a comet's tail, due to OLBER, is the only one which is in the least satisfactory. Its only difficulty is its failure to account for the reversal of the ordinary action of the sun, which in every other known case is attractive.

But the comet is not alone interesting on account of its splendor, or as a representative of a class of bodies which has excited the profoundest emotions in mankind from time immemorial; men of science all over the world are observing it with the deepest interest. That it, with one other

alone, has exhibited in the spectroscope lines characteristic of iridium vapor, instead of just such a series of bands as we may observe in the spectrum of the blue band of a lamp or gas flame, and which we had come to regard as characteristic of comets, is doubtless significant, but we may readily overrate its importance. What is of prime importance, however, is its near approach to the sun and its relation to certain other comets. According to elements of the orbit, calculated at Washington and published on the 24th, the nearest approach to the sun was on the 17th, at which time its distance from the sun's centre was only 800,000 miles, somewhat less than the diameter of the sun; computations at Cambridge, founded on later observations and published on the 26th, reduce this distance to 307,000 miles, a distance evidently too small, because less than the radius of the sun.

As soon as three observations of a comet have been obtained astronomers are able to compute an approximate orbit, the approximation depending upon the accuracy of the observations. This done they not only can predict the position of the comet for some time in advance, but they are then first in a position to tell whether it resembles any other known comet, for these bodies assume such Protean shapes that they can be recognized by the forms of their paths alone. Professor Boss, of the Dudley observatory at Albany, was led to propound the theory, that owing to essential resemblances in the orbits, the comets of 1843, of 1880 and this one are identical. Whether he is correct or not remains to be proved by further observations and elaborate calculations, but whatever Professor Boss proposes is sure to be received with the most respectful consideration by all astronomers. If his theory is established we have evidence of a most extraordinary resistence to the motion of the comet somewhere in its course, probably when near the sun, and a further study may teach us much concerning the conditions obtaining near the sun which we might hope in vain for otherwise.

There is one other point in this connection, which though purely hypothetical, has sufficient plausibility to render it

interesting. If Professor Boss is correct in his views, it is clear that the comet cannot long escape its ultimate fate of falling into the sun. Have we not some evidence that this fate has in part already come upon it? Let us see what evidence lies at hand: There are now on the sun a number of enormous spots, which, on the 17th, were on that portion of the sun nearest the comet at its nearest approach. The formation of a sun spot is attended with enormous disturbances in the photosphere, and, in all probability, any great disturbance in the photosphere would betray itself in the formation of spots. The decay of a comet is known to prodcce a stream of meteors; and, if Professor Boss is right, this comet has long since commenced to decay, for it is no new comet to our system, and no comet can belong to us without loss of its integrity. Nothing, then, can be more natural than to conclude that certain outlying fragments of the swarm of meteors which make up the comet have actually come within the distance of the radius of the sun, and that the extraordinary spots are in reality connected with the comet.—*Baltimore American.*

DRIFTING METEOR TRAINS.

E. E. BARNARD.

The observation of meteors and meteor trains by the naked eye is common, but the study of these interesting objects by the aid of the telescope, so far as we know, is almost wholly neglected, although such work might yield valuable results.

Whenever a train is visible to the unaided eye for several seconds of time, it can aften be seen with the telescope for as many minutes; since this is so, such observations might throw light on the question regarding the existence of a constantly eastward current or currents in the upper atmosphere. We have kept a record of all the trains of meteors observed for nearly a year past, and give the following as the more important part of it:

In 1881, Nov. 16, near 7^h (full account given in *Science*

No. 75, vol. 2, and *Science Observer* No. 35,) magnificent meteor near Capella, many times brighter than *Venus*: traversed a path of about 10° in about two or three seconds toward the north-east; the train remaining plainly visible to the naked eye for six minutes, and in the telescope for over fifteen minutes, its width about one-fourth of a degree, its length the full extent of she meteor's path. The luminous train was knotted with cloudy tufts and crooked in in a most curious manner, constantly changing and of a bright pinkish color. It moved north-east four degrees in fifteen minutes of time.

August 5, near 9^h, 1882; Brighter than a first magnitude star, of a whitish color, rapid in motion. passing a little east of over head. Its flight was from *Cassiopeia* to *Scorpio*. This meteor left a streak nearly 60° long, visible to the naked eye for a few seconds only, but watched in the telescope for fully ten minutes, where it appeared first, very bright and unbroken, straight as a shaft, clean and sharp in outline, and brighter along the axis, but in two seconds it became crooked and sinuous, drifting south-east at the rate of about one degree in two minutes (at this time there was a faint breeze *from* the south-east). The brightness of the train remained very prominent, though it became more and more distorted and crooked each moment. Near the point of disappearance of the meteor there was a very bright irregular mass of glowing vapor which retained its brightness longest, and had the irregularity of the great nubula of *Orion* which it somewhat resembled at times. The gaseous train was more or less distinct though getting faint when observation ceased. The color of this train was that of lightish smoke tinged with a warm glow especially in the southern part of the train near *Scorpio*. A few secnods after the appearance of this meteor, a similar one shot rapidly across the heavens from *Cassiopeia* to the east of south; a train from it was visible for several seconds, but there was no time to examine it with the telescope.

August 10, near 10^h, two bright meteors, white in color, of the first magnitude were seen within a few minutes; both

had short paths and came from *Cassiopeia*; very quick in flight, following nearly the same path toward the west. The track of each meteor was examined—almost while the meteors were in flight—that part of the sky being watched in the hope of catching a meteor in motion. The trains were seen and were similar in every respect, a narrow streak 3° or 4° long melting away in about two or three seconds, affording merely a glimpse: both were straight, their duration was too short to detect any motion; color, light warm.

August 11, near 15^h. nearly of first magnitude, whitish, appeared just north of β of *Auriga*, and traversed a path of about 20° very quickly toward the south: luminous train full length of path, visible to the eye only for a second or two, but watched in the telescope for nearly five seconds in which it appeared long and perfectly straight, much brighter along the axis, but in a few seconds it began to crook and bend, moving rapidly south-east. A bright knot became visible in it which moved much more rapidly, seeming to pull the rest of the luminous streak after it. The motion toward the south-east was one degree in one minute and ten seconds, the train, a pale warm color.

August 18, near $10^h\ 30^m$. Fine meteor equal to a first magnitude star. Very rapid flight towards the south-west, passing a little east of α of *Capricornus*. Luminous train seen with the naked eye only a few seconds, but visible in the telescope for fully ten minutes; at first, as a thin straight line which in a few seconds began to bend and crook itself into serpentine curves, moving the meanwhile slowly toward the north-east, about one degree in three and a quarter minutes. In places along the train were brighter cloudy masses. These had a motion greater than the general train.

August 19, near $13^h\ 30^m$, a fine bright meteor of the first magnitude of a whitish color shot very rapidly across *Cetus* just south-east of *Mira*; motion towards the south, slightly west. Duration of flight over one and one-half seconds, train visible to the eye for about two seconds; with the telescope the train was not continuous there being little or

none of the luminous smoke when the meteor disappeared, while near the point of appearance lay a very bright strip some 30′ long and about 1′ broad ; between this and the south end of the train were numerous bright cloudy masses. The train became quickly distorted, one bright portion moved more rapidly, the rest following in its wake. The bright mass was visible for nearly three minutes, moving at the rate of one degree in thirty-two seconds. This gradually faded from sight without diffusion seeming to melt from view. During the watch it had expanded slightly in size. This train had the most rapid motion of any before observed. The brightest parts would be but a little less than the nebula of *Orion*.

From the above observations many interesting thoughts are suggested. It is apparant that the opportunity for continued observation of the luminous smoke left by the meteor in its retarded flight through our atmophere, is not so very rare and its existence not so transient as might be supposed, not infrequently offering ten orfifteen minutes of observation and possibly, in some rare instances, remaining visible in good telescopes for several hours, thus affording sufficient time for examination into their chemical composition by the aid of the spectroscope. The idea suggests itself to us that observations of the motions of these trains would be invaluable in determining atmospheric currents at great altitudes. There being now no possible means of knowing anything relative to the existence and direction of currents in the upper strata of our atmosphere.

We can ascend but a few miles at most in balloons, and the highest clouds reach very little above that, and at such low altitudes the atmospheric currents are likely to be disturbed and greatly changed by local causes, such as mountain chains, etc. But at such great altitudes where the meteor first enters our atmosphere, there are no local causes to disturb the general direction of the currents, and if we were only able to observe their motion a much better knowledge of the physical construction of our globe's envelope of air might be had.

It is utterly impossible to detect, by artificial means, the

motion of air currents at great distances above the earth. Were it possible to place any object in the upper part of the atmosphere to drift with the currents then we could determine by observation of its movements the direction of motion, velocity etc., of the currents ; or were it possible for clouds to form in the rarer strata, we could by observing them determine the currents along which they drift. As these are manifestly impossibilities we can have recourse to but one agency for bettering our knowledge of the upper currents, and that is, to take advantage of the opportunity afforded by the luminous train left by the occasional meteor.

The meteor strikes our atmosphere with a great velocity —forty or fifty miles a second. Passing our hand through the air we feel but little or no resistence, and certainly no sensible increase of heat, but when that motion is increased a hundred thousand fold, as in the case of the meteor, the resistance encountered is great so that the moving body is at once converted into an incandescent mass of light. Thus the meteor, hurrying swiftly through space, suddenly rushes into our atmosphere which acts like an almost impenetrable shield, checking its velocity which is quickly converted into intense heat, many times greater than that of the hottest furnace. As the meteor is being consumed, it leaves a train of luminous gas or smoke which can but float along with the current of air in the same manner that the smoke from our chimneys moves through the atmosphere, and, like it indicating the direction of the wind or air currents. By frequent observations of these drifting gas trains a general idea could be formed as to the existence and direction of those upper currents. So far, my observations indicate the existence of an easterly current, or currents, of possibly long duration. All the trains observed were drifting easterly, either directly east, or north, or south-east; some in a direction opposite to the meteors' flight. If there were no currents where the meteor passed, we would naturally expect the train from inertia to move slowly in the direction the meteor went; but it is seen that the train overcomes that and assumes a motion that de-

pends undoubtedly on that of a regular current in our atmosphere.

The peculiarity of bending and twisting in meteor trains is produced by denser portions of the gaseous matter. It may be suggested that these are heavier particles sinking more rapidly earth-ward, though these particles will doubtless sink thus towards the earth, yet they are seen, sometimes, to move in a direction different to that we would expect if such were the case. They seem to be more at the will of the air currents, along which the train drifts and are followed by the less dense portions of smoke. These are possibly small fragments thrown off from the meteor by minor explosions. Another remarkable thing is the quantity of luminous gas constituting these trains; in nearly every case it has exceeded three or four cubic miles. This is a great quantity of gas to be evolved by the combustion of such an insignificant thing as the meteor is. It is singular that the train should remain luminous so long. It must be burning to be seen; but why burn so long, as fifteen minutes?

This kind of observation is particularly suited to amateurs. The regular observer with a dome over his head can not do much of this kind of work. But any one with a telescope properly mounted, with a knowledge of the diameter of the field of his eye-piece, and with a desire to do something, can do valuable work by keeping a sharp lookout for bright meteors, quickly examining their paths and recording what he sees. This work is especially adapted to comet sweepers, as they are generally in the open air, and have instruments capable of quick change of position.

To those beginning such observations it may be well to say: Note the direction of flight of the meteor; turn the telescope at once to its path, sweep rapidly back and forth over the place where the meteor passed. If there is a train left you will likely strike it the first sweep. If bright and persistent, sweep the full length of it examining any peculiarities: then let your telescope stand at rest and allow the train to pass across the field, note the time it requires to pass through from edge to edge of field, taking into ac-

count the motion of the sky, note the direction of motion, the width of the train, the time of observation within a few minutes, note the point of observation in the sky etc. When the train begins to bend or become irregular, which it is sure to do if it remains visible any length of time, see if the forward positions (in the direction of motion) are brighter than the general train. It would be well to watch the stars it passes over, also, to note if there is any change in steadiness and brightness as the luminous mass passes over them; write out your observations and send them to the SIDEREAL MESSENGER or some other scientific journal where they will receive proper attention. If several observers some distance apart could attend to this kind of work and carefully record the paths of the meteors seen, it is likely that the same object might be examined by two or more and its height above the earth could be determined, and therefore the actual velocity with which its train moves and the quantity of gaseous matter it contains.

NASHVILLE, Tenn. Sept. 20, 1882.

STANDARD TIME.

In response to the circular of the general time convention, asking for communications bearing upon the matter of a standard time for the railways of the United States and Canada, Admiral Rodgers, late Superintendent of the United States Naval Observatory, wrote the following:

The various countries of the world generally have their own prime meridian, as Greenwich, Paris, Pulkova, etc., and the national maps are drawn to the respective national prime meridians. The maps of the United States are drawn with reference to the meridian of Washington. The observatories of Europe—Pulkova, Greenwich, Paris, etc.—give time to their respective nations. In England the differences of longitude are not great, and all England uses Greenwich time. But the extent of the United States renders a single time impracticable, for by the hour at any place is only sought an expression for the relative position of the sun in regard to that place. At the noon of any local-

ity the sun is on its meridian; at 1 o'clock it is one hour past the meridian: at midnight it is on the lower meridian, or just under the feet, and at 1 o'clock at night it is one hour past the lower meridian. All this is very elementary, and is known to every one.

By local time man must live, move, and have his being. Other standard for his daily avocations is chimerical, fit for speculation, but utterly impracticable. Sailors have for a long time kept on board ship, for their practical purposes, two times—namely, local time, for the daily uses of life, and the time of the national meridian, for astronomical purposes. This is Greenwich, Paris, Pulkova, or other, according to nationality. This arrangement at sea is in constant use by a community far from a learned one, according to shore standards. The system must be plain and practical to landsmen, since it is plain and practiced by seamen.

The plan of time zones seems to me a plan for legalizing diversity. It is against diversity that the country protests, as applied to railroad service. Two neighbors separated by a fence may live in different zones, or two villages near one another may have different zones and different legal times, in which case business will be carried on between them with more difficulty than with natural time, by which people dwelling near one another will have, substantially, agreement in their watches. Two railroads on different sides of a river may have different zones, and trains collide for want of agreement. Except in towns of some size no one would know his zone, for the zones cannot be marked. The State lines are too irregular in shape to serve for a guide, nor have we custom-houses on the borders to inform travelers of the name of the State into which they enter.

Learned societies may recommend artificial time for the use of man, but it is to be apprehended that the community may refuse to accept it. When the laborer, who has worked from sunrise until noon, is gravely told that noon comes at 1 o'clock, will he not object? In short, men will continue to keep natural time for their daily uses, whatever different practice conventions may recommend.

In conclusion, I beg leave to recommend that in the rail-

road guides the time of Washington, the national meridian of the United States, be published opposite to the movements of through trains, leaving, the trains to run on Boston time, or Ogden, or San Francisco, or such other time as the directors may prefer. This plan invades no right now enjoyed; it changes no parctice; it only adds to the tables a few columns of figures. I would also recommend that the clocks at railroad stations be furnished with two sets of hands, gilt hands for Washington time, and black hands for local time. These hands, separated by a constant difference equal to the differences of longitude, will always show at a glance the time required, whether local or Washington.

TRANSIT OF VENUS.

PROFESSOR E. FRISBY, WASHINGTON, D. C.

Extensive preparations are being made here for observing the coming transit of *Venus* on December 6th.

At the last session of Congress a commission was appointed to have charge of all the affairs connected with the transit. This commission consisted of the superintendent of the naval observatory, the president of the national academy of sciences, the superintendent of the coast and geodetic survey, two professors from the naval observatory and the superintendent of the Nautical almanac. The president of the national academy of sciences has since died, leaving but five working members. An appropriation of $75,000 was made for the necessary expenses, with an additional amount of $10,000 for repairs of instruments.

Eight parties have been selected, four in the southern and four in the northern hemisphere, the latter being all in the United States. The equipment of all the parties are very complete, men of experience have all been selected for the different positions, and nothing seems lacking to make a success of the expeditions if the weather should be favorable. Each party will consist of a chief astronomer, who will have charge of the expedition, an assistant astronomer,

a chief and assistant photographer; a zenith telescope will be provided for obtaining time and latitude, a five inch equatorial, a photoheliograph, chronometers, a chronograph, all the necessary photographic apparatus, and in fact everything that is necessary.

The four southern parties will be arranged as follows:

The *New Zealand* party will be under the direction of Mr. Edwin Smith, an assistant in the coast survey, with Professor H. S. Pritchett of the Washington University, as assistant; Mr. Storey of Boston will be the chief photograper, assisted by Theilkuhl. This party expects to start from San Francisco on the 23d of September.

Another party under the direction of Lieutenant Samuel W. Very U. S. Navy, will be stationed at Santa Cruz, Patagonia, with Mr. O. B. Wheeler of the Lake Survey, as assistant. Mr. Bell of Philadelphia, and Mr. Stanley will be the photographers; they left here about the beginning of the present month, and sailed for Liverpool from which place they will take passage to Montevideo, where they will be transferred to the U. S. Navy steamer Brooklyn for Santa Cruz. A third party will be under the direction of Professor Lewis Boss, of the Dudley observatory and will be stationed at Santiago in Chili, with Mr. Miles Rock of the Naval observatory as assistant, Mr. Marcean of Washington and Mr. Cudlip photographers; this party intend to leave New York about the end of the present month and travel by the Isthmus of Panama. The remaining southern party will be under the direction of Professor Simon Newcomb U. S. N. superintendent of the Nautical Almanac, and will be stationed at the Cape of Good Hope. Lieut. Casey, U. S. Army will be his assistant; Mr. Julius Ulke of Washington, and Ensign J. H. L. Holcombe, U. S. Navy photographers; this party will leave New York about the 20th of September.

The northern parties have not been completely made up yet, but it is understood that Professors Hall, Harkness and Eastman of the Naval observatory, Professor Davidson of of the Coast Survey will have charge of the stations at San

Antonio Tex., Washington D. C., Cedar Keys, Florida, and Fort Thorne, New Mexico respectively.

The party at the Cape of Good Hope will only have an opportunity of observing the first part of the transit, and those in New Zealand the last part, as the sun will set at the former place before the transit is over, and at the latter place the transit will be in progress at the time of sun-rise, at all the other stations the full transit will be visible. All the parties will of course try to observe contacts but the best results are expected from the photographs. The different parties have been practicing here for some weeks past, under the direction of Mr. Joseph Rogers who has had charge of all the preparatory photographic work.

UNIFICATION OF TIME THROUGHOUT THE WORLD.

A convention of Engineers met at Dresden last winter, and one of the most interesting problems discussed was the question of introducing a system of universal measurement of time, to be the same at all parts of the globe, at all times.

Dr. Ulbricht, well-known throughout Europe as an expert in such matters, read an interesting essay on the subject, describing the causes of the difference in time between different places, dwelling upon the many inconveniencies resulting from a difference in time of one hour for each fifteen degrees of longitude east or west. The substance of his essay was as follows:

In most of the European countries this inconvenience has been partially done away with, by accepting the true time at the capital city for the standard time for the rest of the country, as has been done by the railroad companies in the United States; whole trains arrive at and leave the intermediate stations by New York or Chicago time

Dr. Ulbricht then spoke with enthusiastic approbation of the ingenious plan proposed by President Barnard of Columbia College, New York, at the convention held recently at Cologne to discuss some of the debated points of international law. President Barnard's scheme is to have

the earth divided by twenty-four meridian lines corresponding to the number of hours in a solar day, and to have the inhabitants of each spot on the globe reckon time by the true time at the nearest meridinal line. By this plan, all places would register minutes and seconds simultaneously, all over the world, the name of the hour only being different at each meridian line. If this much could be secured, it would be a vast improvement on the present irregular system, but it would necessitate perfect standards and exceedingly careful and accurate distribution of time from the appointed centres or standard clocks.

The "time-ball" on the Wartberg (a mountain near Heilbrunn), which was set up more than a hundred years ago by that many-sided genius, Goethe, is a primitive mode of distributing time from a central station to the surrounding stations, and modern science is rapidly perfecting this system, so that complete unison between all the clocks of a country is only a *question of time*.

The pneumatic system gives unqualified satisfaction in Vienna, where it has been thoroughly tested, and other places are introducing it, but the most infallibly accurate means for distributing time either long or short distances is electricity. Simultaneous action in clocks, no matter how widely separated they may be, is ensured by the Hipp system of electric communication, or the Jones system which is in successful operation at Greenwich, Berlin, and several other places. In this latter system the pendulums receive their impulse by the opening and closing of the electric circuit, so that all have a simultaneous vibration. Of course this system makes no allowance for the difference between the time of different localities. If President Barnard's scheme were universally adopted the Jones system would answer admirably in all places.

The Siemens and Halske electrical clocks are provided with a simple little apparatus which allows the minutes and seconds to be recorded on each clock in unison with the central clock, but as the hour strikes it moves the hands back or forward to the place where they belong according to the true time of the place.

The system invented by Dr. Ulbricht himself, and in use in many of the principal depots in Germany, requires the pendulum-rod to be somewhat shorter than usual, so that the clock will gain a trifle each hour. This is remedied by an automatic arrangement that, as the hour strikes, stops the motion of the pendulums in all the secondary clocks until the centre clock has caught up with them, when all vibrate again in unison.

President Barnard's proposition for "cosmopolitan time," as he calls it, comprehended still further changes in the system now in use, which can be briefly summed up as follows; After having decided upon the location of the twenty-four meridianal lines, the whole world should reckon time from a certain one of these lines. For general convenience (and to avoid showing undue partiality to any special country, probably), President Barnard suggests the meridian passing through Behring's straits and the Pacific ocean, for the starting point, and the time midnight.

The hours of the day should be counted from one to twenty-four, inclusive, doing away with the unnecessary annoyance of dividing the solar day into P. M. and A. M. He suggests also that the hours might be designated by the twenty-four letters of the alphabet (leaving out J and W).

By the general adoption of this system or even a modified form of it, all the countries in the world would thus be brought into harmony and "cosmopolitan time" would be recorded simultaneously on the faces of all the clocks in the world, the incalculable advantages of which must be seen to be fully appreciated.

A convention of geographers lately held in Venice passed resolutions expressing their approbation and admiration of President Barnard's plan, prophesying that the present zealous agitation of this subject will before long bring about a radical change in the systems now in use.

It is to be hoped that the coming convention at Washington in May, 1882, will receive the support of the Government in this matter, so that the dawn of the better era may be hastened.—*Translated for* THE JEWELER'S JOURNAL, *from the Allg. Jour. der Uhrmacherkunst.*

OBSERVATIONS OF COMET "B", 1882, AT PRINCETON.

BY PROFESSOR C. A. YOUNG.

The weather has been very unfavorable here, so that observations have been secured only on four mornings since the comet ceased to be visible in the daytime. The dates are Oct. 2d, 4th, 10th and 15th.

I GENERAL OBSERVATIONS.

On Oct. 2d the nucleus of the comet as seen in the twenty-three inch equatorial with a power of 160, was rather ill-defined, and elongated in the direction of the comet's motion, its length (by estimation) being about 10″ and its breadth 4″ or 5″. There were no well-marked envelopes visible around the head of the comet and no jets,—but the seeing was bad. The dark stripe behind the nucleus was distinct, and pretty sharply defined at the edges—could be followed 20′ or so from the nucleus.

There was no sign of a double arc like that seen on Sept. 19th. To the naked eye the tail was slightly curved exceedingly well defined, and very uniformly and solidly bright—about 14° long, and about 2° wide at its extremity.

Oct. 4th, with the same telescope and eye-piece, the nucleus was seen to be much more elongated than on the 2d and shaped like an Indian club—20″ long by 5″ at head. Dark stripe in tail very faint. No jets or well defined envelopes.

To the naked eye the comet was much less brilliant than on the 2d, and the tail instead of being well defined on both sides now showed a considerable amount of faint diffuse light on the concave side near the head.

In the brightening dawn the head disappeared before *α Leonis* but after *α Hydræ*.

Oct. 10th. The observations of this date were made with the nine and one-half inch equatorial. With power of seventy the nucleus was seen very much elongated, almost linear, and ill-defined. As the dawn brightened it was resolved into an irregular row of bright dots four or five in number,

the brightest and roundest being not at the sunward extremity of the row, but the second: between this and the third the light was so feeble that before the comet faded out, the nucleus seemed to be broken in two at this point. The nucleus was nearly 40″ in length.

The dark stripe in tail was still visible, but instead of being in the prolongation of the nucleus, was bent at an angle of about 10° to the left (apparently), and a faint *bright* streak followed the nucleus. To the naked eye the scattered light outside the outline of the tail on the concave side was much more extensive than on the 4th, and the convex edge of the tail was prolonged by a streamer some 4° long (The zodiacal light at 4:30 reached up to a point above Prœsepe.)

Oct 15th, twenty-three inch equatorial. The nucleus showed much the same appearances as on the 10th, composed of five or six knots, and to-day they were not in a straight line, but the row was strrongly curved conformably to the curvature of the tail.

The companion comet, reported by Schmidt, of Athens, could not be found, neither with a hand binocular comet seeker, nor with the nine and one-half inch telescope though carefully swept for by Mr. McNeill. But with the binocular, and even with the naked eye one could not help noticing the curious stripe of faint light, about ½° wide and with nearly parallel edges, extending from the head of the comet *toward* the sun to a distance of 4°.

A letter from Professor Smith of Kansas University had informed me of its existence on the 9th. I did not receive the letter however until the 11th, and did notice the phenomenon on the 10th. The head of the comet was estimated = 3rd magnitude star.

The dark stripe in tail was no longer visible, but a faint bright streak some 2′ long issued from the convex (apparently upper) side of the long nucleus, starting out tangentially very near the brightest of the component dots, and perhaps issuing from this knot which may be the true nucleus. After dawn the separation between this knot and the next one became as marked as on the 10th.

II SPECTROSCOPIC OBSERVATIONS.

Oct. 2. Used the one prism Clark spectroscope on the great equatorial. The spectrum of the nucleus consisted of a fairly bright continuous spectrum, overlaid by the usual carbon bands, and one or two lines. The D line was distinctly seen and seen double, but was faint and hard to catch. The fourth carbon band in the violet was also faint. The brightest carbon band (near *b*) was very bright and beautifully defined, showing clearly the three bright lines in it, which were seen in the great comet of 1881. A direct comparison with the blue base of the flame of a small wax candle, showed a perfect coincidence between its bands and those of the comet. No dark lines were visible in the comet spectrum. The cometary bands were easily seen all through the head of the comet, and by opening the slit could be traced a long distance into the tail.

Oct 4. Used first a wide-angled spectroscope of two prisms, with condensing lens in tail piece of great equatorial. Results same as on the 2d, except that the sodium lines could no longer be seen at all, and the violet band was barely visible. With the one prism Clark spectroscope D could still be made out *very* faint.

Oct 10. Nine and one-half inch equatorial with Grubb automatic spectroscope, used dispursive power of two prisms. Spectrum rather faint. No D line, and the sharp lines in the green band could not be made out. Followed band spectrum into tail nearly 1° from the head.

Oct. 15. Grubb spectroscope on twenty-three inch equatorial. Nothing new.

In every case the observations were kept up until interfered with by dawn.

PRINCETON, N. J. Oct. 17.

The planets *Saturn* and *Jupiter* will be favorable objects for evening study during the present month. *Saturn's* rings will be divided by small telescopes.

EDITORIAL NOTES.

Those in charge of the MESSENGER desire to remind its many friends, that all manuscript for publication should be written plainly and carefully, on one side of the paper only. Especial pains should be taken in writing the names of persons and of places.

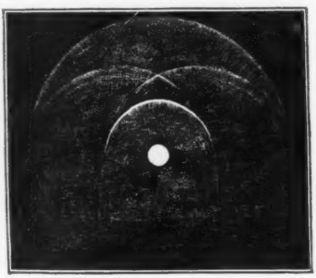
October 11, a telegram from Washington announced the discovery of a comet by Professor J. F. J. SCHMIDT of Athens, Greece. Its position was reported to be four degrees south-west of the great comet with motion in the same direction.

We call attention again to the important observation on Cruls' comet made by Professor C. A. YOUNG Sept. 19, $0^h\ 30^m$ Princeton M. T. Its position then was:

$$\alpha = 11^h\ 20^m\ 19.^s2 \pm 0.^s5$$
$$\delta = +0^\circ\ 12'\ 7'' \pm 5''$$

He said: "The comet was beautifully seen in the five-inch finder which was screened from the glare by the tube of the great telescope. It presented very closely Brodie's figure of Coggia's comet of 1874 given in the frontispiece of Chambers' Descriptive Astronomy, third edition, though of course the fainter veilings could not be seen."

"The nucleus was diffuse, not stellar (magnifying power about 75); the first envelope was pretty bright, and well defined extending out on each side to form the tail, and the second envelope was easi y visible though rather faint.



The interesting feature however was the pair of eccentric arcs connecting the two envelopes as shown in the accompanying figure copied from the work above referred to. They were not conspicuous but I think there was no doubt of their reality."

Observer F. HESS of Fort Dodge, Iowa, made a drawing of the comet Oct. 9, at $5^h\ 6.^m$ A. M. Oct. 8th $23^h\ 23^m$ Greenwich M. T.

Distances observed with sextant corrected for index error only.

Regulus to comet's nucleus	24° 6′ 00″	good.
α Hydrae " "	16° 33′ 50″	good.
Moon's center " "	14° 23′ 40″	uncertain.

No division of nucleus visible with a power of fifty.

A late issue of the New York *Nation* gave full notice of the instructions prepared by the American Commission for observing the Transit of *Venus*, Dec. 6, 1882. Its concise statements are just suited to our wish, and we copy the following:

The parties organized by the Secretary of the Navy are invested with naval character, and subject to naval rules, regulations, and discipline. The command of each party is assigned to the Chief Astronomer, the order of rank and authority in each party being as follows: Chief Astronomer, Assistant Astronomer, Chief Photographer, Assistant Photographer. The instructions were prepared primarily for the use of the parties organized by the Commission, but as the Transit will be visible in this country, they have also been adapted to the use of amateur observers who desire to be made acquainted with the methods by which they may make observations of value. Detailed directions are given for the selection of observing stations, and for setting up instruments. The success of the American system of photography, on the occasion of the Transit of 1874, has led the Commission to rely chiefly on this method of observing the coming Transit. A very considerable portion of the 'Instructions' is therefore devoted to the photoheliograph, the instrument by which the pictures of the Transit are taken. The pamphlet of instructions contains explicit memoranda regarding the photoheliograph and its adjustments, the heliostat, the exposing-slide, the photographic tube, the plate-holder plumb-line, the batteries and electrical connections, the measuring rod, errors of the photoheliograph, fittings of the photographic house, care of the sensitive emulsion, selecting and marking glass, cleaning albumenizing glass, coating-plates, exposure of plates in the photoheliograph, the development, fixing and varnishing, blistering and lifting of the film, spots and other defects, preliminary practice, preparation for the Transit, photographing the Transit, developement and packing of the Transit-plates, wet emulsion-plates, bath wet-plates, and general precautions. Other sections treat of time-observations and chronometer-comparisons, exchange of time with other parties, latitude and longitude of station, the employment of the equatorial telescope, and the observation of occultations of stars by the moon for finding the longitude of stations not otherwise determinable.

Under the head of general instructions respecting observations of contact, it is said that, with regard to the determination of time, arrangements will be made with the Western Union Telegraph Company to transmit time-signals from the Naval observatoy to every part of the country. The aperture of telescope to be preferred in the observations is from five to six inches. Apertures as small as four inches may be used without serious detriment, and three inches may be regarded as the smallest with which observations of real value can be made. The eye-piece should have a magnifying power of not less than 150, nor much more than 200. An equatorial mounting is nearly indispensible

to accurate observation, and a clock-motion is desirable. A regular filar micrometer will not be of any use as an instrument of measurement. If shade-glasses are used, they should be made of three thicknesses of glass, the piece next the eye being thickest and darkest in color, all being fitted loosely into their cell so as to allow free expansion. An aperture of five inches may then be used without danger of splitting the sunshade. The observer must attend carefully to the firmness of of the telescope, to his ability to move it so as to keep any part of the sun's edge steadily in the centre of the field, and to the accuracy of the focal adjustment. The degree of brilliancy of the sun's disk as seen by the eye is to be particularly attended to; and the American instructions suggest a simple modification of the method of reducing this brilliancy recommended by the Paris International Conference. The conditions necessary to the making of a really good observation of external contact of the planet and sun are such that but few observers will be able to secure anything worth recording. From the time of external contact to that of internal, a period of about twenty minutes, the observer should have little or nothing to attend to, in order that he may be prepared, optically and mentally, for the important observation of internal contact. All the confusing difficulties attendant upon this observation are specifically dealt with, and mention made of every precaution which may lead to a successful and valuable observation. The final sections of the pamphlet relate to methods of recording contacts, measures of the diameter of Venus, data required in reducing the observations, the records of observations and operations, and the transmission and publication of observations. Appended are four lithographic plates showing (1) the lines of synchronous internal contact at ingress, (2) egress, (3) the illuminated hemisphere of the earth at the middle of the Transit, (4) paths described by several stations through diurnal motion, as seen from the sun during the Transit.

The publication of a series of professional papers by the U. S. Signal Service, U. S. A., has recently been commenced by the Government, and will undoubtedly embrace within its scope much valuable matter. The initial volume was a "Report on the Solar Eclipse of July 1878," by Prof. Cleveland Abbe. It contains illustrations of 28 observations. The second of the series is "Isothermal Lines of the United States 1871–80," by Lt. A. W. Greely, U. S. A., consisting of a series of 12 outline maps. The others of the series as far as published, are

No. 3. Chronological List of Auroras, observed from 1870 to 1879, compiled by Lt. A. W. Greely, U. S. A.

No. 5. Information relative to the Construction and Maintenance of Time-Balls.

No. 6. The Reduction of Air Pressure to Sea Level at Elevated Stations West of the Mississippi River, by Henry A. Hazen, A. M.

U. S. TRANSIT OF VENUS PARTIES AND STATIONS.

Cape of Good Hope.	Chief Astronomer, Prof. S. Newcomb, U. S. N. Ass't Astronomer, Lt. T. L. Casey, jr., U. S. Eng'r. Add'l Ass't Ast'r, Eng'r J H L Holcombe, U S N. Photographer, Mr. Julius Ulke.
Santa Cruz, Patigonia.	Chief Astronomer, Lt. Sam'l W. Very, U. S. N. Ass't Astronomer, Mr. O. B. Wheeler. Photographer, Mr. Wm Bell. Ass't Photographer, Mr. Irvin Stanley.
New Zealand.	Chief Ast'r, Mr. Edwin Smith, U. S C. & G. S. Ass't Astronomer, Mr. Henry S. Pritchett. Photographer, Mr. Augustus Story. Ass't Photographer, Mr. Gustav Theilkuhl.
Santiago de Chile.	Chief Astronomer, Prof. Lewis Boss. Ass't Ast'r, Mr. Miles Rock, Ass't Ast'r, U S N O. Photographer, Mr. Theo. C. Marcean. Ass't Photographer, Mr. Chas. S. Cudlip.
San Antonio, Texas.	Chief Astronomer, Prof. Asaph Hall, U. S. N. Ass't Astronomer, (not yet chosen.) Photographer, Mr. D. R. Holmes. Ass't Photographer, (not yet chosen.)
Cedar Keys, Fla.	Chief Astronomer, Prof. J. R. Eastman, U. S. N. Ass't Astronomer, (not yet chosen.) Photographer, Mr. George Prince. Ass't Photographer, Mr. Geo. F. Maxwell.
Fort Thorn, New Mex.	Chief Ast'r, Prof. Geo. Davidson, U. S. C. & G. S. Ass't Astronomer, (not yet designated.) Photographer, (not yet designated) Ass't Photographer, Mr. T. S. Tappan.
Washington, D. C.	Chief Astronomer, Prof. Wm. Harkness, U. S. N. Ass't Astronomer, (not yet chosen.) Photographer, (not yet chosen.) Ass't Photographer, (not yet chosen.)

SOLAR RESEARCHES IN HIGH ALTITUDES.

Prof. Langley presented in *Nature* recently the results of his last summer's investigations of the sun's heat radiation. It has been said that the determination of the amount of heat the sun sends us is "the fundamental problem of meteorology," and these investigations were conducted in the best way to solve it. Prof. Langley's station was on Mount Whitney, California, nearly 13,000 feet above sea-level, where he found the sky perpetually fine and extremely dry. In 1837 M. Pouillet, and in 1856 Sir John Herschel made experiments at stations near sea level to ascertain the amount of heat received from the sun, but their deductions were less satisfactory because at low levels the atmosphere is too replete with watery vapor. As a mountain chain of only 6,000 feet altitude cuts off one-half of the vapor in the atmosphere, the station selected by Prof. Langley, which left about three-fourths of this

beneath the observer, was peculiarly eligible. Although the reduction of his observations is still incomplete, he announces that they apparently show that the true constant of solar heat is one-half greater than that determined by Pouillet and Herschel. His conclusion as to what would be the temperature of a mountain-top shooting entirely above the air of our planet, or that of the sunward hemisphere of the earth if the aerial covering were withdrawn, is that the earth's temperature would at any rate fall 50 degrees below zero, so that mercury would freeze and "remain solid under the vertical rays of a tropical sun where radiation into space wholly unchecked." The earth's loss of heat by radiation in the absence of aqueous vapor in the air is so rapid that Sir John Richardson long ago pointed out that to this cause more than to polar cold was due the intense refrigeration in winter of Arctic America, and Mr. Ericsson has forcibly suggested that the surface of the airless moon, radiating heat so much faster than it can absorb it, must be cold in sunshine. This investigation is of the highest interest to weather science, and should be continued at one or more high mountain summits, where the atmosphere is freest from watery vapor.

THE TOTAL SOLAR ECLIPSE OF 1883.

According to a statement in *Nature* in the issue of Sept. 21, observations of this eclipse will be limited to stations on one or two of the smaller islands of the Marquesan groups, the Roberts islands of the British Admiralty charts. They are in longitude 141° west, and latitude about 9° south. Mr. Charles H. Rockwell, of New York, in a paper read before the section of Astronomy at the Montreal meeting of the American Association pointed out the fact, that there is a small island in the south Pacific ocean which is favorably situated for an observation of this eclipse. As his paper contains information not generally known we give a brief abstract of it:

The astronomical event of chief interest for the coming year, 1883, is the the total eclipse of the sun to occur on the 6th of May.

At the point of greatest obscuration the total phase will last for nearly six minutes; but unfortunately, there is no land at this precise locality on which an observer can rest the sole of his foot, or place an instrument. In fact the line of totality is almost wholly a water track among the islands of the south Pacific ocean, commencing off the southern coast of Australia and running in a north-easterly direction to about 5° south latitude in longitude 127° west, thence turning south-easterly towards South America but terminating before reaching this coast.

There is however a small island in latitude 9° 54′ south longitude 150° 06′ west known to navigators as Caroline island. It was visited by Capt. Nares, the Arctic explorer in 1874, who gives its position as above. It is about nine miles long by one mile in width. Some thirty natives were living upon it at the time of Capt. Nares' visit.

This point is far within the limits of the moon's shadow, although not exactly on the central line. It is however so well situated as to make it desirable that it should be occupied by an astronomical party at the time of the eclipse.

In order to reach it, a steamer must be especially chartered for the trip; the general idea being to sail from San Francisco about the 20th of March next, with the expectation of reaching the island at least two weeks before the date of the eclipse, so as to allow sufficient time for building piers of mason work on which to set up the instruments, buildings of rough boards to shelter them, obtaining the rates of chronometers, and ascertaining the position of the island with increased accuracy.

A totality of five minutes and forty seconds may be expected at this point. It ought to be utilized to add largely to our present knowledge of the constitution of the sun and the phenomena attendant on such an event, especially as no such opportunity of long totality will again occur during the lifetime of any person now living.

The expense of such an expedition is estimated at $10,000, and if the right men can obtain leave of absence from their duties in order to make the trip, it is believed that the money can be procured by subscription from the friends of science in this country and in England.

The expedition might be expected to return to San Francisco by the first of June.

There will be an eclipse with long totality in 1886, but the central line is in the south Atlantic ocean, with no position on land which can be occupied as an observing station.

Late observations of the great comet show that its path is deviating somewhat from the trial orbits first computed. Accordingly Mr. CHANDLER of Cambridge assisted by Mr. WENDELL has computed the following

ELLEPTICAL ELEMENTS.

$T =$ Sept. 17. 1880. Greenwich Mean Time.

$$\left.\begin{array}{rrrr} & {}^\circ & {}' & {}'' \\ \pi = & 58 & 31 & 1 \\ \omega = & 71 & 39 & 3 \\ \Omega = & 346 & 51 & 58 \\ i = & 142 & 35 & 51 \end{array}\right\} \text{Mean Eq. 1882.0.}$$

$$\begin{aligned} \log.\ q &= 7.943316 \\ e &= 0.997898 \\ a &= 4.17535 \\ \mu &= 415''.8790 \\ \text{Period} &= 3116 \text{ days.} \\ &= 8.532 \text{ years.} \end{aligned}$$

A cable message, from Dr. H. Oppenheim to the SCIENCE OBSERVER.

was received at Boston on October 1, giving the following parabolic elements of Comet Cruls, computed by him at Berlin:—

ELEMENTS.

T = Sept. 17.23. Greenwich Mean Time.

$$\left.\begin{array}{l} \omega = 69^\circ\ 6' \\ \Omega = 345\ \ 42 \\ i = 141\ \ 48 \end{array}\right\} \text{Mean Eq. 1882.0.}$$

$\log. q = 0.0076$

Professor C. PIAZZI SMYTH, Astronomer-Royal of Scotland, in a letter to the editor of the *Scotchman*, dated Sept. 24, recognizes a leading American astronomer in a complimentary way. Alluding to Professor Boss' views that the great comet now in view, is identical with that of 1843 and 1880, and that its period is rapidly growing short, he says: "Indeed nothing so important to all mankind has occurred before through 1800 years, at least of astronomical history; and there is this prospect of the statement being true, that it is given under the name of Professor LEWIS BOSS, one of the most able and learned mathematical astronomers of the Union, and we may say now (such has been the rapid progress of Astronomy in that country during the last few years) in the *world*."

Professor EDGAR FRISBY of Naval observatory, Washington, D C. kindly furnishes the following observations of Cruls' Comet:

	Wash. M. T.			α				δ		
	h	m	s	h	m	s		°	′	″
Sept. 19.1	2	45	21.8	11	19	40.17	+	0	7	34.6
19.9	on meridian			11	14	18.94	—	0	34	28.5
20.9	on meridian			11	0	10.97	—	1	19	21.1
23.7	18	3	45	10	58	16.	—	3	10	30.5
29.7	17	22	18.9	10	43	4.25	—	6	29	15.4
Oct. 1.7	17	30	30.6	10	39	14.66	—	7	29	10.5
6.7	17	27	6.5	10	31	1.55	—	9	47	51.4
8.7	17	17	25.7	10	28	6.53	—	10	40	21.9
9.7	17	25	57.2	10	26	41.70	—	11	6	25.2

The last observations only have been compared with well-known stars; two more observations have been made, one on October 4.7 and one on October 14.7, they have not yet been satisfactorily reduced, for that on October 4th no star-place has yet been found, and the weather has been cloudy and rainy most of the time for the past week.

A CURIOUS FEATURE OF CRULS' COMET.*

Under the date of Oct. 19, Prof. H. S. S. SMITH of the University of Kansas, sends the following important observations of this comet:

"The comet-seeker used has an object-glass of five and five-eighths inches in diameter and forty-two inches focal length. The tube is bent so that the eye-piece is always horizontal, the reflector being a right angled prism. The power used was 141.

On October 9th at 4:30 a. m., the nucleus appeared coarsley granulated and elongated in the direction of the tail. There was no dark streak in the tail near the nucleus. Along the north side of the comet, between 20′ and 25′ from the nucleus, and running parallel, or nearly so, to the center line of the tail, there was a faint streak of light, quite distinctly bounded on the north side but fading gradually away toward the comet proper. The brilliancy was about equal to that of the tail at its apparent termination, certainly not as bright as the place where the spur on the south side of the end joins the broader part of the tail. This faint streak of light extended toward the sun fully 30′, but its end was ill-defined On the south side there was a similar but fainter streak of light about 15′ from the nucleus, parallel to the axis, and extending about 15′ toward the sun. Both of these streaks extended westward from the nucleus until they met the tail proper, expanded.

On October 13th, at 4 a. m., saw the streaks again. They were apparently at the same distances from the nucleus, but a little longer in the direction of the axis. There was a haze between them extending across the front of the nucleus. The brighter part of the tail was enveloped in a thin haze and the streaks appeared to be a forward continuation of this.

On October 14th the streaks had become united into a continuous haze that extended nearly 90′ in front of the nucleus, and appeared bounded on the sides by parts of a parabola, but the extreme eastern end was indefinite in outline. On this morning I could see the haze with the naked eye.

On October 15th, the haze was somewhat longer and broader and the sides were curved. The end was still ill-defined.

On October 17th, the extension was about the same as on the 15th but the brightness was decidedly less.

It is but just to say that the haze was seen by a number of other persons, and by myself through two field glasses and a small terrestrial telescope, so that I cannot think it a fault of the comet-seeker or a peculiarity of vision.

Prof. C. A. Young writes me that he saw the haze on October 15th his clear morning."

NEW OBSERVATORY AT BOGOTA, (COLUMBIA.)

From two impassioned letters, printed in *L'Astronomie*, we learn that Don Jose Gonzales has built and equipped and also endowed, a small observatory in Bogota. Its principal instruments are a four inch equatorial, a small meridian circle, spectroscopes, etc. The facade

bears the touching inscription:—"Observatoire Flammarion.—A la France.—A Flammarion.—"

We wish all success to our South American sister.

LICK OBSERVATORY.

It is stated in the *Times* of San Jose that $114,000 has been spent this year on the buildings of the Lick observatory. About one half of the observatory will be roofed by November 1. When the observatory is finished the main building will be 215 feet long, sixty feet wide in the center part and forty feet wide at the ends. At the north-west corner stands the small dome, thirty feet in diameter and forty-six high, which contains a twelve-inch Clark telescope. At the south end the dome for the thirty-six-inch Clark refractor will be placed. The excavations for the cellar of this structure are now begun.

The transit house was finished in October 1881. It contains a four inch transit by Fauth. The photoheliograph is directly south of this and is now partially mounted.

THE WORK OF THE OBSERVATORY OF PARIS FOR 1882.

From the report of the director of the Paris observatory, we extract the following: The asteroids, which have been observed at Paris and at Greenwich for the past fifteen years, are now to be observed a t Par. is only. It has been found at Greenwich that the bad weather seriously interferes with the progress of the work; and Admiral Mouchez has therefore undertaken the whole of this labor at Paris.

LALANDE'S CATALOGUE OF STARS.

The observation of the stars of Lalande has been going on at Paris for some years, as is well known. During the past three years this work has been made the chief work of the Meridian service, and it is hoped that the whole of these observations will be finished in 1882. The catalogue will be published in Paris, and it is expected that part 1, comprising 23,640 stars, will be sent to the printer during the year.

This will be the most important contribution to stellar astronomy that could be rendered.

The eighteen observers of the Meridian service have made 28,747 observations during the year. The observations of the sun, moon, planets and comets amount to 1,018. These are reduced by the Bureau des Calculs. The equatorials are employed as before in observations of planets, comets, and asteroids. The large reflector will be re-silvered, and devoted to photographic and spectroscopic work.

The meteorological observations, the time-services, and the astronomical school of Montsouris continue as formerly.

Visitors are admitted (by the written permission of the director) once a month. Four hundred persons come on the average, and the uses of the various instruments are explained to them by four of the astronomers, in regular turn.

The observatory is about to undertake an investigation of the variations of the vertical, which have been remarked by Messrs. D'Abbadie and Darwin. From the terms in which this research is spoken of in the report, it is evident that it is not considered to be one which promises to be very fruitful in results. The large refractor is still in process of construction, it will be clear, from the brief resume here given, that the observatory of Paris is engaged in work fully worthy of its great name, and of its past services to astronomy.

E. S. H.

The star O. Arg. S. 20,200 whose place for 1860 is R. A. = $19^h 57^m 34^s$; Dec. — 22° 36′ is given by ARGELANDER as 8 mag.

In Wash. Mural Zone 181 it is 8.9;

In Wash. Transit Zone 162 it is 9;

LAMONT (No. 436) gives it as 6.7;

LALANDE (No. 38.250) gives it as 8;

In the Paris chart (No. 60) it is 8;

The Washington Transit observed it twice (1868 Oct. 1, and Oct. 16) as 7.0 and 7.2. It is probably a bright 8 mag.

Its R. A. in YARNALL's Catalogue for 1860 (No. 8,665) requires a correction of $+ 1^s$.

E. S. H.

PROPER MOTION OF LACAILLE 4955.

$11^h 51^m 59^s$; — 27° 1′ 5″; 1880.0.

This star probably has proper motions of about

$+ 0^s.08$ and $+ 0'.6$

right ascension and declination.

E. S. HOLDEN.

The star O. Arg. S. 15,292 is given by ARGELANDER as 8.9 mag. It occurs in the Wash. Mural Zones 31, 114, 122, 167 as of the 9 8, 8.9 and 9.10 mags. respectively. In the Meridian Circle Zone 124, it is given as 7 mag. In the Transit Zone 154 as of the 9th. Yarnall (2 observations) gives it as 7.3 mag. Its declination in O. Arg S. is too far south by 1′.

E. S. HOLDEN.

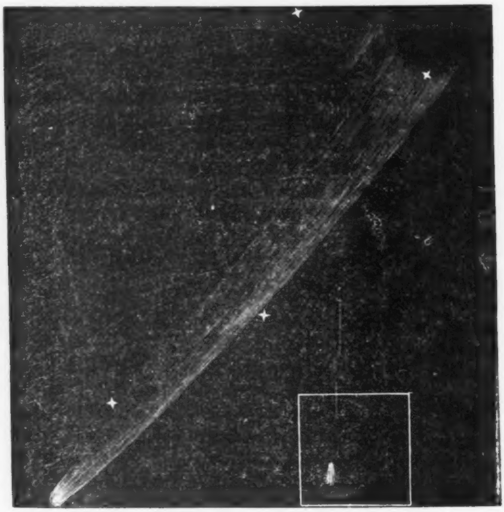
The U. S. Transit of *Venus* party to be stationed at the Cape of Good Hope is under the charge of Professor NEWCOMB U. S. N. It is understood that Professor NEWCOMB will return by way of England, and that he proposes to remain abroad until September 1883.

Professor DANIEL KIRKWOOD Oct. 23, says:—"At Washington, Indiana, Oct. 20, thirty meteors were counted by Professor D. E. Hunter, from 4^h to $4^h 30^m$. Twenty-three of this number had their radiant in *Gemini*. This shower of *Geminoids* was also observed at Bloomington by Prof. T. A. WYLIE, but the exact number was not recorded. These gentlemen had risen to watch the comet, when their attention was attracted by the unusually frequent appearance of meteors."

COMET CRULS.

The following cut very well represents the appearance of the great comet to the naked eye, as seen on the morning of Oct. 17, at 4^h 30^m at Carleton College observatory.

The drawing was made by Miss Professor Armsby whose quick eye and skillful pencil are often rendering us excellent service in this way.



The star in the upper margin of the cut is *Alpha Hydrae*. It is not made as prominent as it should be to represent a second magnitude star. The remaining three stars in and near the train have not been identified. The unequal shading of the north and south marginal lines of the train is quite faithfully shown. The elongated nucleus making a considerable angle with the axis of the tail is represented in the lower part of the cut. This view was obtained by the eight inch equatorial, power 50, the same day at 4^h 30^m observatory M. T.

MESSRS. WARNER & SWASEY of Cleveland, O. have completed the mounting of the equatorial telescope for Beloit College observatory. The photograph of it, at hand indicates stability and neatness of design. The declination circle is graduated to one-fourth degrees, and by vernier reads to minutes. The hour circle is divided to minutes, and reads to five seconds. The driving clock has the improved conical pendulum. The telescope is nine and one-half inches aperture with focal length of eleven feet and four inches, and is provided with a micrometer lighted by Mr. Burnham's new method.

On page 193 is given a list of eight places to be occupied by as many U. S. Transit of *Venus* parties. The list of observers as there given is incomplete. Later advices from Washington fill the vacancies as follows:

In Prof. J. R. Eastman's party, Lieut. John A. Morris, U. S. N. is assistant astronomer.

In Prof. Asaph Hall's party, R. C. Woodward of Detroit is assistant astronomer, and George H. Hulburt of Belvidere, Ill. is assistant photographer.

In Prof. Geo. Davidson's party, James S. Lawson and J. F. Pratt both of the coast survey, are assistant astronomers, and D. C. Chapman, U. S. coast survey is photographer.

Professor W. Harkness will have charge of the party to be stationed at the Naval observatory. The personnel of the party has not been selected except that Mr. Joseph A. Rogers will probably act as photographer. The parties are all expected to be at their stations by the 1st of November.

Under date of Oct. 21, observer WM. R. BROOKS of Phelps, N. Y writes:—"While sweeping in the region of the great comet, this morning with the nine-inch reflector, I discovered a cometary mass eight degrees east of the great comet. It was elongated and nearly two degrees in length. The part towards the sun was broader and slightly more dense than the rest, and clearly resembled the well-known separated portion of BIELA's comet. I believe it to be an envelope thrown off from the great comet in its recent disturbed stage."

Mr Brooks' drawing and observations of the great comet recently published in the *Scientific American* are valuable astronomical data.

Acting director H. C. WILSON of the Cincinnati observatory has sent drawings and full notes of observations of Cruls' comet made Oct. 5, at $4^h\ 40^m$, Oct. 6, $5^h\ 40^m$ and Oct. 7, $5^h\ 30^m$ in the morning of each day. The division of the nucleus seems distinct

We have also seen the drawings and notes of E. E. BARNARD of Nashville, Tenn. made Oct. 7, at $4^h\ 30^m$ which very clearly resembles those of Mr. WILSON.

MR. JOHN CLACEY of Boston is now making for Mr. E. SAWYER of Cambridgeport a four and three-eighths inch refractor. He has just completed one of six and one-fourth inches aperture for MR. CHANDLER which is mounted in the west dome of Harvard College observatory. Competent judges pronounce it to be an excellent instrument. MR J. O. TIFFANY of Attleboro, Mass. has a six inch telescope by the same maker.

MR. F. M. BOOKWATLER of Springfield, O. has a ten inch and an eighteen inch silver-on-glass reflector, G. CALVER's make both of which are mounted equatorially. He has also a two and one-fourth inch Fauth transit, and a Fredsham clock.

Observer WM. R. BROOKS, of Phelps, N Y. writes as follows:

"A meteor was seen here on the morning of Sept. 4th. It was particularly interesting for the apparent slowness of its motion. Its brilliancy was equal to *Jupiter* at the present time, but much whiter inclining to blue. It was seen to start first below *Aldebaran* passing in a south-easterly direction across *Orion*, and disappearing eight degrees north of *Procyon*. The time of visibility was five seconds. The motion was not halting, but wonderfully slow and uniform. A faint train of short duration was left.

Comet seeking has been regularly carried on with the new nine inch reflector. Many faint nebulæ have been detected and recorded. BARNARDS' and CRULS' comets have been observed, my first observation of the latter being on the morning of Sept. 24th. The very marked changes in the structure of the nucleus were observed and announcements thereof furnished. The nucleus was best observed when daylight had so far advanced as to render the tail invisible. This was no doubt largely owing to greater altitude. The wonderful secondary tail was detected on the morning of October 8th."

MESSRS JAMES W. QUEEN & Company of Philadelphia, recently sent us a variety of slides or astronomical illustrations mounted for the lantern or stereoptican. We lost no time in giving these specimens the searching test of a strong oxy-hydrogen light, and we are glad to say that almost every one of the pictures stood it exceedingly well, showing good judgment in the selection of engravings and skill in the photographic art. We commend this inexpensive and impressive means of illustration for the class and lecture room to the attention of teachers of astronomy in colleges and secondary schools everywhere.

MR. JOHN BYRNE of New York, is getting justly a wide reputation for skillful work in telescope objectives. Mr. George H. Littlefield, Syracuse, Nebr. is about to order a telescope from this maker.

An important work is announced by the publishing firm of E. J Brill, in Leiden, which cannot fail to extend our knowledge of the planet *Mars*. Whatever one may think of SCHROETER as a philosopher, one must admit his excellence as an observer. The title of the work is Areographische Beitrage zur genauern Kenntniss und Beurtheilung des planeten Mars, in Mathematisch:Physischer Hinsicht, von Dr J. H. Schroeter. Mit Atlas von 16 Kupfertafelm. Nach dem Manuscripte auf der Leidner Sternwarte herausgegeben von H. G. van de Sande Bakhuyzen.

BOOKS.

Celestial objects for common telescopes by the Rev. T. W. Webb A., F. R. A. S. fourth edition, revised and greatly enlarged. New York Industrial Publication company. 1881 pp. 493. Retail price $3.

Astronomers universally speak of this as a "charming little book" Previous editions were published only in England, but the popularity and demand for it, both in England and America have become so great, as to lead the author to re-write and enlarge it, and American publishers to print it. The rapid diffusion of a taste for astronomical observation during the last few years, and the great variety of important data tersely put and conveinently arranged in this little volume are suprising, and in themselves enough to indicate something of its merit, and to explain its popularity. Any young person with a love for the study, who has, even, a two inch telescope and WEBB's celestial objects, will have profitable and enjoyable business enough, on hand, for years. It seems to us that any teacher of astronomy in college or secondary school that will be content to instruct classes long withoui these helps, or something in the place of them, will be likely to do at best poor second-hand work, which is little less than a waste of time and mind. For it is as WEBB beautifully and truly says, "None but an eye-witness of the wonder and glory of the heavens can thorougly understand how much they loose by description, or how inadequate an idea of them can be gathered in the usual mode, from books and lectures. It is but the narration of the traveler instead of the direct impression of the scene. To do justice to this noble science, to appreciate as we ought the magnificient testimony which it bears to the eternal Power and God-head of Him Who with His excellent wisdom made the heavens we must study it as much as may be, not with the eyes of others but with our own."

Elements of Quaterions by A. S. Hardy, Ph. D. Professor of Mathematics, Dartmouth College, Boston, Published by Guin, Heath & Co. 1881, pp. 230.

Beginners in the study of the Quaterion Calculus will find in this book the best statement of elementary principles and notation known to us in the English language. To one versed in the higher mathematics, it reads as easily and naturally as a popular treatise on the theme. Such a work as this has been greatly needed, and will be welcomed by all desiring to study this compartively new and powerful instrument in mathematical research. Tate's work is too difficult for the average beginner, and Hamilton is diffuse and wearisome. Hardy is clear, concise, logical and well arranged for the class-room. We commend it to the attention of mathematicians generally.

Astronomy for schools and general readers, by Isaac Sharpless, Professor of Mathematics and Astronomy, Haverford College, and Prof. G. M. Philips, Principal, State Normal School, West Chester, Pa. Philadelphia, Messrs. J. B. Lippincott & Co., publishers 1882, pp. 303.

This book begins with suggestions to teachers about some aids to supplement the study of the text-book and the ordinary recitation, such as star-maps, celestial globe, and star lantern, a telescope of any size &c., some of which are within the reach of most instructors, and the use of them will add interest to the study. What a student sees or realizes for himself is peculiarly his own knowledge. The author prefers the topical method of recitation, because he thinks the student will get a connected, and a more complete knowledge of the subject in this way, and accordingly the book has been arranged on this plan. The class led by the teacher, should go out under the sky, and point out the constellations, principal stars, and planets, and familiarize their knowledge thus by getting it from the text-book, and by a true effort of mind, putting it in the heavens where it belongs. The introduction presents the early history of astronomy, a general view of the heavens, and something concerning the usefulness of astronomy.

Part I treats of the solar system comprising 214 pages, and is a brief, fresh but careful setting forth of the details at present known respecting planets, comets and meteors and their relatives in the celestial family.

Part II is devoted to the sidereal universe, in which first the constellations are studied by the help of appropriate maps, then follows the consideration of double-stars, variable stars, clusters and nebulae and the structure of the universe.

Part III gives a description of the more important astronomical instruments with illustrations of the kinds described, and some of their uses in the study of the heavens. The subject matter of the book is well chosen. Its treatment is not encumbered with needless details, which any student can not long remember if he learn and which if remembered would be of little practical use in after life.

The language is plain, direct and usually exact. The absence of technical terms so generally is also in keeping with the most effective plan for elemantary study. To secure good illustrations for an elementary text-book in astronomy, is a very difficult task always. Though not complete, the authors success in this particular is gratifying.

This book will be used in Carleton College.

BOOKS AND PAMPHLETS RECEIVED.

Wentworth's Complete Algebra –Ginn & Heath, Boston.

Graphic Algebra by A. W. Phillips and W. Beede—Henry Holt & Co., New York.

Maderia Meteorologic by C. Piazzie Smyth, Astronomer Royal of Scotland. Publisher, David Douglas, Edinburgh.

Annual of Harvard College Observatory, vol. XIII. Pt. 1.

Photographic Spectrum of comet (Wells), 1. 1882, by William Huggins.

A comparison of the Harvard College Observatory catalogue of stars for 1875 with the Fundamental Systems of Auwers, Safford, Boss and Newcomb, by William A. Rogers.

Instructions for observing the transit of *Venus* Dec. 6, 1882. Washington, D. C.